TENNESSEE DEPARTMENT OF EDUCATION
FIRST TO THE TOP

Computer Systems

Primary Career Cluster:	Information Technology (IT)
Consultant:	Casey Haugner Wrenn, (615) 532-4879, Casey.Haugner@tn.gov
Course Code:	6094
Prerequisite(s):	*Information Technology Foundations* (6095), *Algebra I* (0842, 3102)
Credit:	1
Grade Level:	10-11
Graduation Requirement:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other IT courses.
Programs of Study and Sequence:	This is the second course in the *Networking Systems* program of study.
Aligned Student Organization(s):	Skills USA: http://www.tnskillsusa.com Brandon Hudson, (615) 532-2804, Brandon.Hudson@tn.gov Technology Student Association (TSA): http://www.tntsa.org Amanda Hodges, (6150 532-6270, Amanda Hodges@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit http://tn.gov/education/cte/work_based_learning.shtml.
Available Student Industry Certifications:	CompTIA A+
Dual Credit or Dual Enrollment Opportunities:	There are no known dual credit/dual enrollment opportunities for this course. If interested in developing, reach out to a local postsecondary institution to establish an articulation agreement.
Teacher Endorsement(s):	153, 311, 435, 436, 475, 476, 582, 595, 740
Required Teacher Certifications/Training:	A+, NetPlus, CIW, or CISCO Industry Certification
Teacher Resources:	http://www.tn.gov/education/cte/InformationTechnology.shtml

Course Description

Computer Systems is an intermediate course designed to prepare students with work-related skills and aligned certification in the information technology industry. Content provides students the opportunity to acquire knowledge in both theory and practical applications pertaining to hardware, operating systems, safe mode, command prompt, security, networking, printers, peripheral devices, laptops, mobile devices, troubleshooting, and customer service management. Upon completion of the course,

proficient students will have acquired skills and knowledge to install, configure, and maintain computer systems. Students who are proficient in this course will be eligible to pursue the IT industry-standard credential, CompTIA's A+ certification. Standards in this course are aligned with Tennessee State Standards for English Language Arts & Literacy in Technical Subjects.*

Program of Study Application

This is the second course in the *Networking Systems* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Information Technology website at http://www.tn.gov/education/cte/InformationTechnology.shtml.

Course Standards

Safety

1) Accurately read, interpret, and demonstrate adherence to safety rules, including rules published by the (1) National Science Teachers Association (NSTA), (2) rules pertaining to electrical safety, (3) Internet safety, (4) Occupational Safety and Health Administration (OSHA) guidelines, and (5) state and national code requirements. Be able to distinguish between rules and explain why certain rules apply. (TN Reading 3, 4, 6)

2) Identify and explain the intended use of safety equipment available in the classroom. For example, demonstrate how to properly inspect, use, and maintain safe operating procedures with tools and equipment. (TN Reading 3, 4)

Career Exploration

3) Explore the types of technical certifications recognized in the information technology (IT) industry. Write a brief paper that distinguishes between vendor neutral and vendor specific certifications, providing examples of each. Explain why earning technical certification is advantageous to IT professionals. Cite evidence from technical literature and industry standards to support claims. (TN Reading 1, 2, 4; TN Writing 2, 4)

4) Locate and access the Computer Technology Industry Association (CompTIA) website and analyze its structure, policies, and requirements for CompTIA A+ certification. Identify what steps are required to obtain the certification, and explain how to prepare for the examination. (TN Reading 2, 3, 4)

Hardware

5) Research the following storage devices and backup media. Create a table or other graphic organizer that lists examples of each device and details their purpose, characteristics, and proper maintenance. Demonstrate proper installation and configuration of each device while using the appropriate media.
    a. Optical drives
    b. Combo drives and burners
    c. Connection types
    d. Hard drives

e. Solid state / flash drives
f. RAID types
g. Floppy drive
h. Tape drive
i. Media capacity

(TN Reading 2, 4, 8; TN Writing 2, 4)

6) Identify and explain the following motherboard components. Citing specific examples, write a brief paper differentiating between the components and describing the purpose, properties, and characteristics of each.
   a. Expansion slots
   b. RAM slots
   c. CPU sockets
   d. Chipsets
   e. Jumpers
   f. Power connections and types
   g. Fan connectors
   h. Front panel connectors
   i. Bus speeds

   (TN Reading 2, 4; TN Writing 2, 4)

7) Given an assignment with defined hardware specifications, identify the appropriate power supply. Noting the following technical components, write a text explaining the various types of power supply that were considered. Citing specific evidence, explain the characteristics of each and how the final selection was determined. Install the appropriate power supply.
   a. Connector types and their voltages
   b. Specifications (e.g., wattage, size, number of connectors, etc.)
   c. Dual voltage options

   (TN Reading 2, 3, 4; TN Writing 1, 4)

8) Explore various types of central processing units (CPU). Describe the following characteristics of the CPU types. Identify appropriate cooling methods (e.g., heat sink, fans, thermal paste, liquid-based) for each type discussed and justify the selection with supporting evidence.
   a. Speeds
   b. Cores
   c. Cache size/type
   d. Hyperthreading
   e. Virtualization support
   f. Architecture (32-bit vs 64-bit)
   g. Integrated GPU

   (TN Reading 2, 4; TN Writing 1, 4)

9) Investigate the following memory types. Create a table or other graphic organizer that describes, compares, and contrasts each type. Explain the memory compatibility and speed, as well as the appropriate application of each memory type. Cite evidence supporting each application prescribed.
   a. DDR
   b. DDR2

c. DDR3
d. SDRAM
e. SODIMM
f. RAMBUS
g. DIMM
h. Parity vs. non-parity
i. ECC vs. non ECC
j. RAM configurations
k. Single sided vs. double sided

(TN Reading 2, 4, 7; TN Writing 4)

Operating Systems

10) Research the features and requirements of Microsoft operating systems. Write a brief paper that compares and contrasts the operating systems. Drawing on multiple resources, explain why it is important to know this information when installing and configuring an operating system. (TN Reading 3, 4, 5; TN Writing 2, 4)

11) Identify and explain various alternatives to install and configure an operating system. For a given assignment, install and configure an operating system by selecting the most appropriate method. Upon completion of the work, write an explanation and justify the actions by citing supporting evidence from technical manuals and industry standards. The explanation should include, but is not limited to, information on the following:
    a. Boot methods (e.g., USB, CD-ROM, DVD, PXE)
    b. Type of installations (e.g., creating image, unattended installation, upgrade, multiboot, etc.)
    c. Partitioning (e.g., dynamic, basic, primary, extended, logical)
    d. File system types/formatting (e.g., FAT, FAT32, NTFS, CDFS, quick format vs. full format)
    e. Loading alternate third party drivers
    f. Workgroup vs. Domain group
    g. Driver installation
    h. Factory recovery partition

    (TN Reading 2, 3, 4; TN Writing 2, 4)

12) Demonstrate an understanding of how to apply the following command line tools to identify problems with networking and operating systems. For a given assignment, follow the multistep process to execute an appropriate command and justify why it was selected to perform a specific action.
    a. Networking (e.g., PING, TRACERT, NETSTAT, IPCONFIG, NET, NSLOOKUP, NBTSTAT)
    b. Operating system (e.g., TASKKILL, BOOTREC, SHUTDOWN, TASKLIST, MD, RD, CD, DEL, FORMAT, COPY, XCOPY, ROBOCOPY, DISKPART, SFC, CHKDSK)

    (TN Reading 2, 3, 4)
13) Demonstrate the proper selection and use of the following operating system features and tools. For a given assignment, explain the selection of the tools and the results.
    a. Administrative (e.g., local security policy, Windows firewall, performance monitor, etc.)
    b. MSCONFIG (e.g., general, boot, services, startup, and tools)
    c. Task Manager (e.g., applications, processes, performance, networking, users)

d. Disk management (e.g., drive status, mounting, extending partitions, splitting, adding drives, adding arrays, etc.)
e. Command line utilities (e.g., MSCONFIG, REGEDIT, CMD, SERVICES.MSC, MMC, MSTSC, NOTEPAD, EXPLORER, MSINFO32, DXDIAG)

(TN Reading 2, 3, 4)

14) Demonstrate the proper application of the following control panel utilities that are common to all Microsoft operating systems, as well as those specific to unique Windows operating systems. Write a text describing the utilities and explain the results of the various applications.
    a. Internet options (e.g., connections, security, general, privacy, programs, advanced)
    b. Display/Display settings
    c. User accounts
    d. Folder options (e.g., view hidden files, hide extensions, general options, view options)
    e. System (e.g., performance, remote settings, system protection)
    f. Windows firewall
    g. Power options (e.g., hibernate, power plans, sleep/suspend, standby)

    (TN Reading 2, 3, 4; TN Writing 2, 4)

15) Identify and describe the differences among the following basic operating system security settings. Write a brief paper that discusses when each setting is most applicable. Provide specific examples to support the claims.
    a. User and groups (e.g., administrator, power user, guest, standard user)
    b. NTFS vs. share permissions (e.g., allow vs. deny, moving vs. copying file folders and files, file attributes)
    c. Shared files and folders (e.g., administrative vs. local folders, permission propagation, inheritance)
    d. System files and folders
    e. User authentication (e.g., single sign-on)

    (TN Reading 2, 3, 4; TN Writing 1, 4)

Safe Mode and Command Prompt

16) Demonstrate an understanding and application of safe mode versus the command prompt. Describe specific scenarios when the safe mode should be used to solve a problem, as well as provide specific examples of the types of tasks that can be completed using the command prompt. Also, describe when the safe mode should be used with the command prompt. For example, safe mode can be used to solve problems with corrupted and/or malicious applications. (TN Reading 2, 3, 4)

Preventative Maintenance Procedures

17) Create and execute a plan for preventative maintenance for a computer system. The plan should include a schedule and description of the following procedures. Write a justification that explains to a client why preventative maintenance is important.
    a. Backup
    b. Check disk
    c. Defragmentation
    d. Windows updates

e. Patch management
f. Driver/firmware updates
g. Antivirus updates

(TN Reading 2, 3, 4; TN Writing 1, 4)

Security

18) Research and describe the most common security threats to computer systems, such as social engineering, malware, phishing, viruses, etc. Investigate and distinguish among the following common prevention methods to secure a computer system. For a given scenario, identify the most applicable best practice to secure a workstation as well as describe methods for data destruction and disposal. Implement these practices and write a justification for each scenario solution. Provide supporting evidence for each solution, drawing on technical texts and industry standards. Prevention methods include:
    a. Physical security (e.g., lock doors, tailgating, biometrics, badges, key fobs, retinal, etc.)
    b. Digital security (e.g., antivirus, firewalls, antispyware, user authentication, etc.)
    c. User education
    d. Principles of least privilege

    (TN Reading 2, 4; TN Writing 1, 4, 6, 7)

Networking

19) Identify and describe the following fundamental principles of a small office / home office (SOHO) network (wireless and wired router).
    a. MAC filtering
    b. Channels (1 -11)
    c. Port forwarding, port triggering
    d. SSID broadcase (on/off)
    e. Wireless encryption
    f. Firewall
    g. DHCP (on/off)
    h. DMZ

    Create and execute a plan to configure, install, and upgrade a SOHO network. Upon completion of the work, write an explanation and justify the actions by citing supporting evidence from technical manuals and industry standards. (TN Reading 2, 3, 4; TN Writing 1, 4, 8, 9)

20) Given scenarios for both wired and wireless small office home office (SOHO) networks, develop and execute an appropriate plan to secure the network. The plan should address, but is not limited, to the following:
    a. Wireless network
        - Change default user-names and passwords
        - Changing SSID
        - Setting encryption
        - Disabling SSID broadcast
        - Enable MAC filtering
        - Antenna access point placement
        - Radio power levels

- Assign static IP addresses

b. Wired network
   - Change default usernames and passwords
   - Enable MAC filtering
   - Assign static IP addresses
   - Disabling ports
   - Physical security

Justify the plan with evidence supported by technical literature and industry standards. (TN Reading 2, 3, 4)

Servers

21) Create a document that explains the purpose and components of a server. Include descriptions of the various types of servers (e.g., file, email, web, etc.) and the hardware specifications required to support each type. Using multiple resources, cite evidence to support the information identified and discussed. For example, a file server used in a home office will not require as much RAM (random access memory) as one that supports a large office building. (TN Reading 2, 4, 7; TN Writing 2, 4)

Printers and Peripheral Devices

22) Explore and distinguish among the following printer types. Briefly describe their similarities and differences, as well as the imaging process required for applicable printer types. Explain why it is important to know this information when installing and configuring printers.
    a. Laser
    b. Inkjet
    c. Thermal
    d. Impact

    (TN Reading 2, 3, 4)

23) For a given assignment, write and execute a plan to install, configure, and maintain a printer that is most appropriate for each of the following example situations. Explain and justify the selection with supporting evidence from technical manuals and computer systems texts.
    a. Installing and configuring onto a specific operating system
    b. Print device sharing (e.g., wired, wireless, printer hardware print server)
    c. Printer sharing (e.g., via operating system settings)

    (TN Reading 2, 3, 4; TN Writing 1, 4, 7)

24) Distinguish among and describe the following peripheral devices commonly found in computer systems. Install and configure these devices conforming to technical manuals and industry standards.
    a. Input devices (e.g., mouse, keyboard, touch screen, scanner, barcode reader, etc.)
    b. Multimedia devices (e.g., digital cameras, microphone, webcam, camcorder, MIDI enabled devices)
    c. Output devices (e.g., printers, speakers, display devices)

    (TN Reading 2, 3, 4, 7)

Laptops

25) Identify and explain the following laptop components. Citing specific examples, write a brief paper differentiating between the components and describing the purpose, properties, characteristics, and proper maintenance of each. Demonstrate proper installation and configuration of each component. For example, replace an optical drive in a laptop.
    a. Expansion options (e.g., express card, PCMIA, SODIMM, flash)
    b. Keyboard
    c. Hard drive
    d. Memory
    e. Optical drive
    f. Wireless card
    g. Mini-PCIe
    h. Screen
    i. DC jack
    j. Battery
    k. Touchpad
    l. Plastics
    m. Speaker
    n. System board
    o. CPU

    (TN Reading 2, 4; TN Writing 2, 4)

26) Compare and contrast the following components within the display of a laptop and the laptop features. Citing specific examples, write a brief paper differentiating between the components and describing the purpose and characteristics of each. Demonstrate the execution of the features. For example, turn on the keyboard back light.
    a. Components:
        - Types (e.g., LCD, LED, OLED, plasma)
        - Wi-Fi antenna connector/placement
        - Inverter
        - Backlight
    b. Features
        - Special key functions
        - Docking station vs. port replicator
        - Physical laptop lock and cable lock

    (TN Reading 4; TN Writing 2, 4)

Mobile Devices

27) Explore the following basic features of mobile operating systems. Write a brief paper that compares and contrasts these systems on the following features. Drawing on multiple resources, explain why it is important to know this information when installing and configuring an operating system.
    a. Open source vs. closed source/vendor specific
    b. App source (app store and market)
    c. Screen orientation (accelerometer/gyroscope)
    d. Screen calibration
    e. GPS and geotracking

    (TN Reading 4, 7; TN Writing 2, 4)

28) Research and describe the most common security threats related to mobile devices. Investigate and distinguish among the following common prevention methods to secure a mobile device.
    a. Passcode locks

b. Remote wipes
c. Locator applications
d. Remote backup applications
e. Failed login attempts restrictions
f. Antivirus
g. Patching/OS updates

(TN Reading 2, 4)

Troubleshooting

29) Investigate a simple problem and create a flowchart, or other graphic illustration, that explains the following steps representing a general troubleshooting theory.
    a. Gather information from the user or operator and back up data
    b. Verify the problem exists
    c. Isolate the cause of the problem and generate alternative solutions
    d. Plan a solution and resolve the problem
    e. Verify that the problem was resolved and prevent a future occurrence
    f. Document findings, resolution, and preventative maintenance plan

    Compare and contrast the findings, resolution, and maintenance plan with those of other classmates. Provide supporting evidence for any selections that differ from classmates, and work together to come to a consensus on a resolution. (TN Reading 2, 3, 4; TN Writing 1, 4)

30) Given a problem related to the following components, follow the troubleshooting theory using appropriate tools. Identify the problem and document the findings and resolution. Include an explanation of the common symptoms, diagnostic procedures, and specific tools used that led to the problem resolution.
    a. Motherboards, RAM, CPU, and power
    b. Hard drives and RAID arrays
    c. Video and display
    d. Wired and wireless networks
    e. Client-side network connectivity
    f. Operating systems
    g. Security issues
    h. Laptops
    i. Printers

    (TN Reading 3, 4, 9; TN Writing 1, 4)

Customer Service and Client Relations

31) Compare and contrast the processes of servicing customers on the phone, online, on-site, or in a shop. Based on the findings, write a brief description of how to service a customer in each of these situations. Include the following in the description:
    a. Identify questions that a customer should be asked to identify his/her problem
    b. Approaches to dealing with difficult customers
    c. When it is appropriate to escalate a problem to a senior support team member
    d. How to document the services provided

    (TN Reading 2, 3, 4, 6; TN Writing 2, 4)

Standards Alignment Notes

*References to other standards include:

- TN Reading: Tennessee State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects; Reading Standards for Literacy in Science and Technical Subjects 6-12; Grades 9-10 Students (page 62).
    - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standard 10 at the conclusion of the course.
- TN Writing: Tennessee State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects; Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12; Grades 9-10 Students (pages 64-66).
    - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standards 3, 5 and 10 at the conclusion of the course.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.